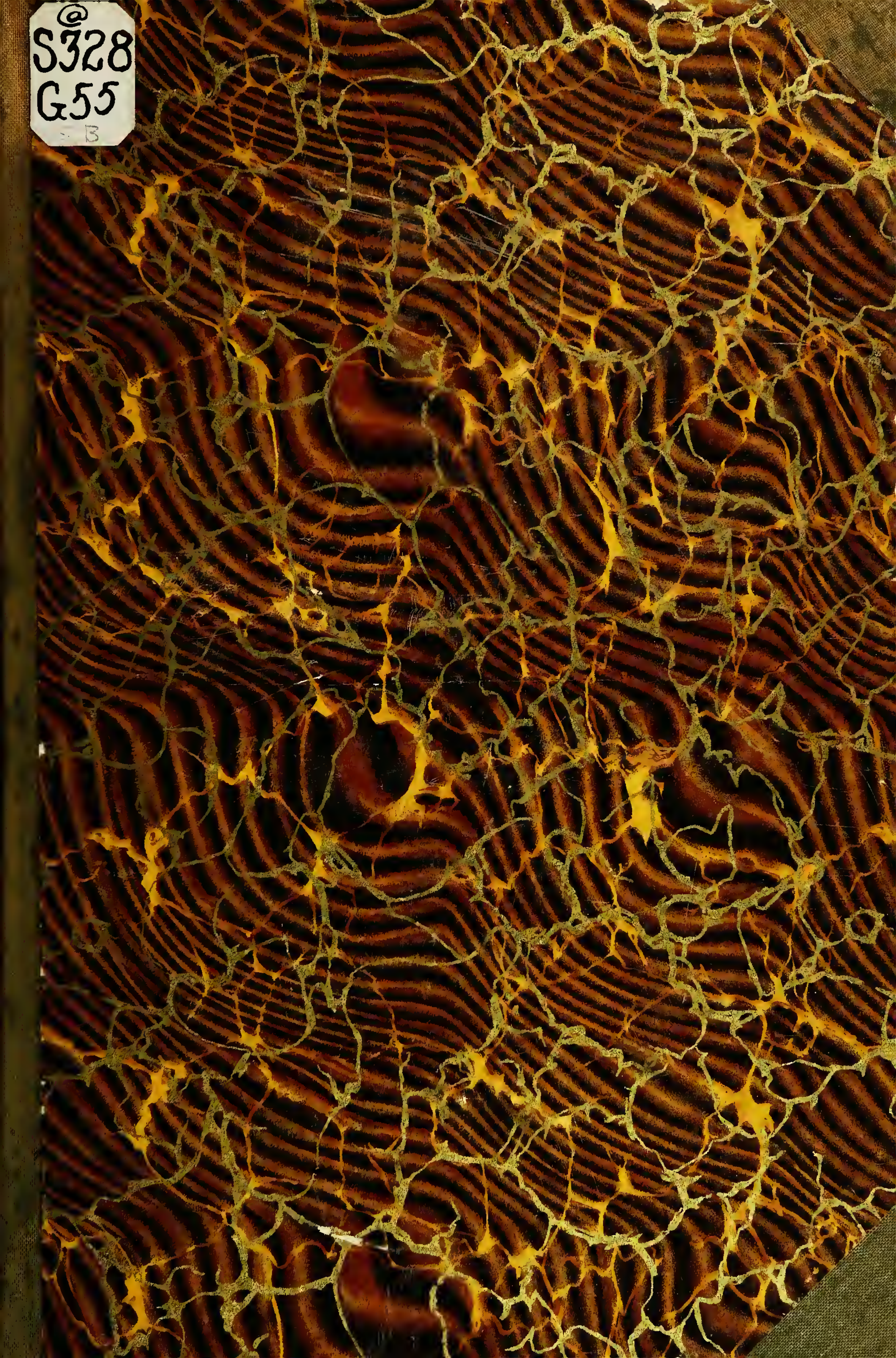

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UNION OF SOUTH AFRICA

DEPARTMENT OF AGRICULTURE

PROSPECTUS

OF THE

Glen School of Agriculture and Experiment Station

GLEN, ORANGE FREE STATE

PRETORIA
THE GOVERNMENT PRINTING AND STATIONERY OFFICE
1920

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UNION OF SOUTH AFRICA

DEPARTMENT OF AGRICULTURE

PROSPECTUS

OF THE

Glen School of Agriculture and Experiment Station

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Printed by the Government Printer, Pretoria.
138—8/1/20—1,300

Students' Hostel.

INTRODUCTION.

THERE are at present, in the Union of South Africa, five Schools of Agriculture with their Experiment Stations. These are situated at Elsenburg. Mulder's Vlei, in the South-west Cape; Grootfontein, Middelburg, in the Eastern Midlands of the Cape; Potchefstroom, in the Transvaal; Glen, in the Orange Free State; and Cedara, in Natal. Each institution is located on a large farm and is well staffed and equipped.

The distribution of the institutions is such that they are fairly representative of the different farming conditions found in the Union, and each school devotes itself to those branches or systems of farming practised in its area. Particulars of these will be found in the prospectuses of the schools, and students are advised to choose that school serving the area in which they are afterwards most likely to farm. The scope and standard of the courses of instruction at all the schools, as well as the fees charged, will be found to be uniform.

The diploma course is designed to afford a sound, up-to-date education in farming to the youth of the country, and it offers as complete and thorough a training in agricultural practice and science as is possible in two years. Particular attention is given to practical work. Approximately one-half of the time of the student is devoted to the acquisition of some skill in the various farm operations, and in farm handy-work, such as blacksmithy, carpentry, and saddlery, and the remainder of his instruction is by means of lectures and laboratory work, reading and study.

In addition to the diploma course, special courses of varying duration are offered appropriate to the more specialized farming pursuits in each area. These are designed for the diploma student proposing to practise such a branch of farming, and for those who have had some experience in such a branch and desire to improve their knowledge. Short vacation courses are also provided for farmers and their wives and daughters, rural school teachers, and others interested in agricultural pursuits.

The educational services of the schools do not end here. They are extended to meet the needs of the farmer who cannot come to the school, by means of external lectures and demonstrations, by co-operative experimental work with farmers, by advisory services through correspondence and visits to farms, orchards, poultry yards, etc., and by the publication of numerous articles and bulletins.

Further important functions of the schools consist in the carrying out of experimental and investigational work—the results of which become part of the material for education, both within and without the school—and the breeding of pedigree live stock for sale to farmers.

Applications for enrolment as a student, and all other inquiries, should be addressed direct to the Principal.

ALEX. HOLM,
Under-Secretary for Agriculture.

October, 1919.

STAFF.

The staff at present consists of:—

Principal	M. J. Joubert, B.S.A.
Vice-Principal	~~G. J. Bosman, B.S~~.A. E. Parish B.Sc.

Lecturers and Instructors, etc.

Agriculture and Stock	(1) M. J. Joubert. (2) ~~G. J. Bosman, B.S.A~~. (3) E. K. Hall, M.Sc.
Agricultural Chemistry	du Plessis
Assistant Chemist	~~G. V. Cutler, A.M.S~~.T. H. H. Cornell B.A.
Entomologist	R. Bigalke, B.A., M.A.
Veterinary Science	P. Fourie, M.R.C.V.S.
Sheep & wool,	v.d. Merwe
Agricultural Engineering and Building Construction	J. W. Cleghorne.
Dairying	~~B. W. Sutton, N.D~~.D. Coles.
Poultry Husbandry	J. J. Jordaan. Mosely.
Horticulture	E. G. L. Smith.
Farm Manager and Instructor in Practical Agriculture	R. J. Matthew.
Farm Foreman and Field Instructor	D. J. du Plessis.
Itinerant Instructor in Poultry	A~~. R. Oliver~~. Lombard.
Assistant to Lecturer in Poultry	~~E. W. Hawkes~~. Back.
Stockman	~~John Forsyt~~h. Moggridge
Shepherd	C. P. Watermeyer.
Mechanic	R. H. M. Jackes.
Carpenter	S. A. Page.
Smithy Work	W~~. Roelofse~~. du Plessis.
Extra-Mural Lecturers:—	
Agricultural Botany and Zoology	~~G. C. Nel, B.A., Ph~~.D.
~~Sheep and Wool~~	~~Officer of Sheep Division.~~
Forestry	Officer of Forestry Division.
Medical Officer	Dr. S. M. de Kock, M.B.
Matron	Mrs. A. Kruger.
Visiting Chaplains	Ministers from Dutch Reformed, Anglican, Wesleyan, and Presbyterian Churches, Bloemfontein.

Prospectus of the Glen School of Agriculture and Experiment Station.

SITUATION AND AREA.

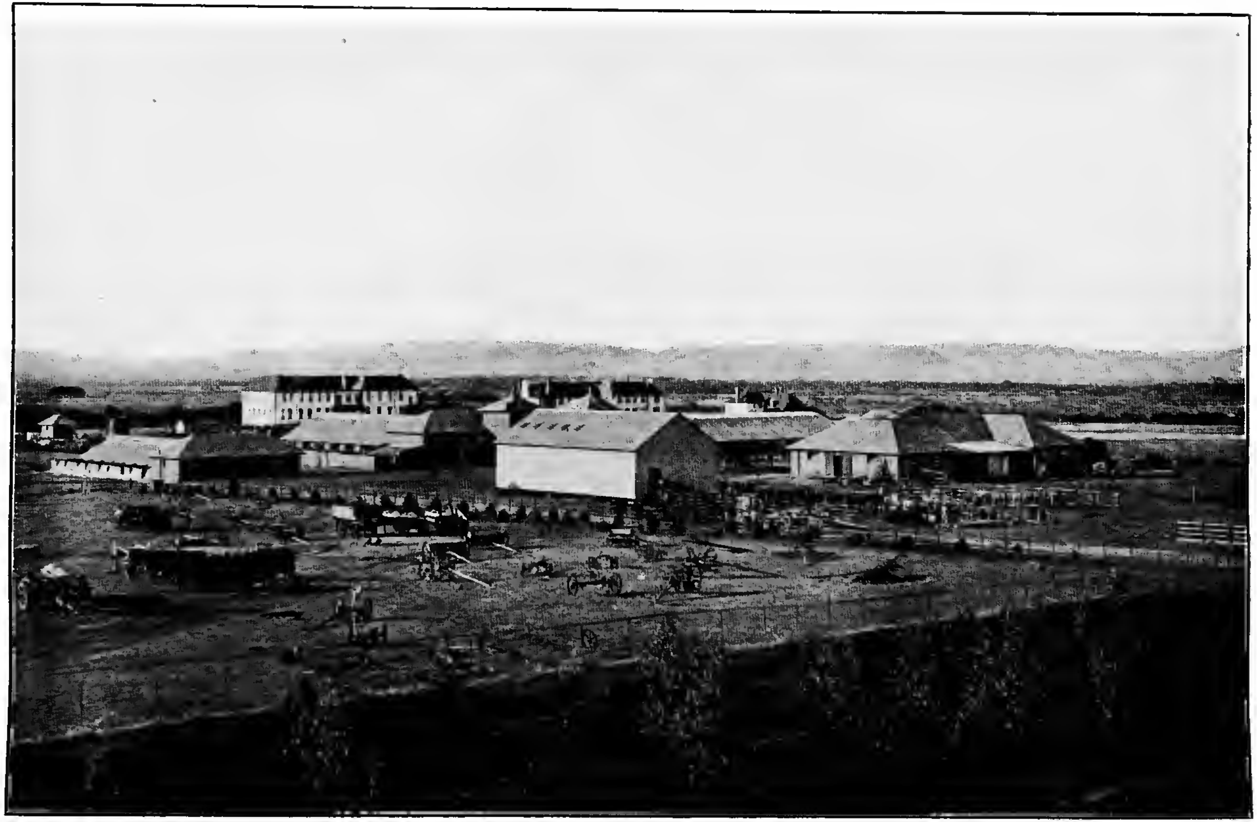
THE Glen School of Agriculture and Experiment Station is situated in the heart of the Orange Free State, being some fourteen miles north of Bloemfontein on the main railway line to the Transvaal. It is also cut by the main road from Bloemfontein to Brandfort, so that the school is easy of access by road and rail. Glen Station, on the railway line, is about 1½ miles from the school buildings, and morning and evening passenger trains pass both into Bloemfontein and out, from and to the Transvaal.

The area served by the institution as a centre of agricultural education and extension work among farmers comprises the whole of the Orange Free State and that portion of the Cape Province lying north of the Orange River.

HISTORY AND DEVELOPMENT.

The farm in earlier days formed part of a very large farm, Klipfontein, which had been in the family of Pretorius for many years. It was traversed by the Modder River for a considerable distance. As has been the custom among the Dutch farmers whenever a family partition is made of a river farm, upon the division of the old large farm among the sons, each portion received land on both sides of the river, so that the farm which later came into the hands of the Government for the purpose of establishing the present institution is fortunate in having a considerable acreage of irrigable land bordering the river on both ~~its banks~~.

The farm on which the school is situated was purchased by the Government in 1912. Its extent is just under 2000 morgen, and the price paid was £10 per morgen. At the time of its purchase it consisted of bare veld, with a few farmhouses and outbuildings. Very little fencing and paddocking had been done; cultivation had been confined to a small acreage, and there was no water system save a few dams and windmills. The intention of the Department of Agriculture was to establish upon this bare site at the earliest possible date a well-equipped modern school of agriculture. Comprehensive school and farm buildings were planned, and a commencement was made with these in 1914, prior to the outbreak of war. An almost



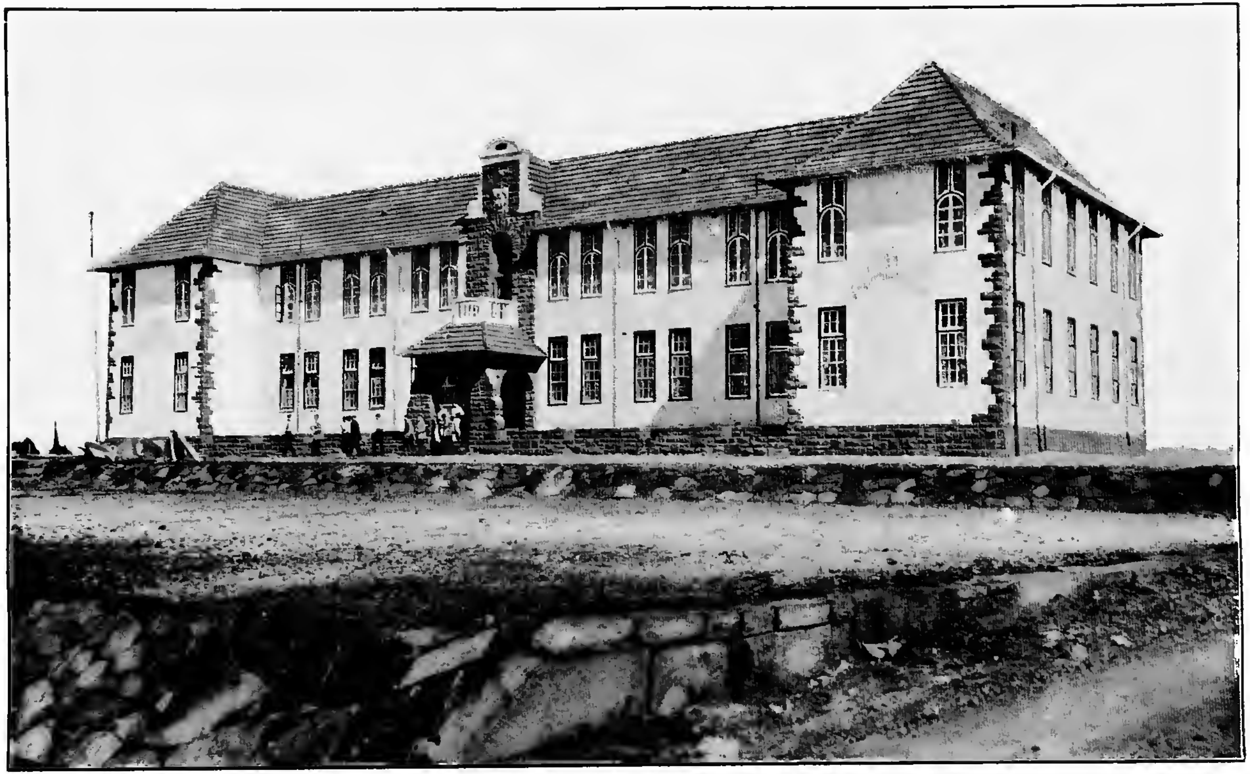
General View of School and Farm Buildings complete set of farm and educational buildings and a students' hostel were completed within eighteen months, and these were followed immediately by the erection of an irrigation plant for the pumping of water from the Modder River, and the installation of electric lighting and a water supply to serve the main buildings. Drinking-water for stock was provided in all existing and proposed future camps on the farm. Fencing was carried out on a large scale. An orchard was planted, and a scheme of landscape gardening was undertaken to relieve the severity of the bare veld and buildings.

Unfortunately the outbreak of war very considerably affected the completion of these plans. The impossibility of procuring educational equipment and staff of technical officers and lecturers while the war was in progress led to a protracted postponement of the opening of the school to students. The financial stringency in the third year of the war to its end, besides curtailing much development work then in hand, was responsible for the abandonment of the construction necessary to complete the school and farm buildings, including a dairy, married quarters for staff, and an additional students' hostel. The institution, however, was not idle during these years. Good herds of cattle and pigs, studs of horses, and flocks of sheep were established, and annual sales of the progeny of these were begun. The poultry division was brought into full activity. A large amount of extension work was conducted among the farmers of the area by the small staff resident at the school, and experimental fields were laid out.

Balcony, Students' Hostel.

After the close of the war some of the remaining buildings were undertaken, as well as the class and laboratory equipment for the school. These will be completed during 1920, and the additional hostel for students will follow.

The institution was opened for the reception of students in February, 1919.



Educational Building.

DESCRIPTION OF THE INSTITUTION.

The main buildings are divided into three groups:—

1. The educational group.
2. The residential group.
3. Farm building group.

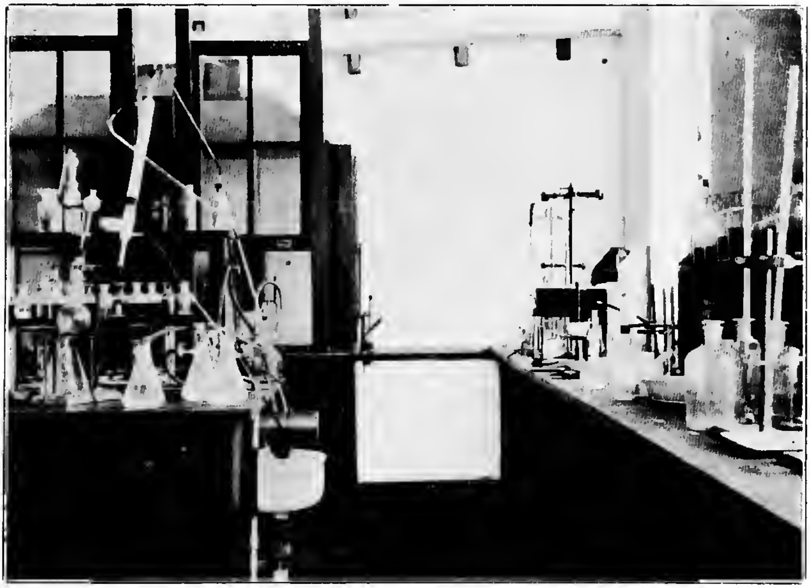
The Educational Building.

This is a two-storied building in brick, with stone facings and tile roof. It contains lecture and demonstration rooms and laboratories for work in the following subjects: Chemistry, botany, zoology, veterinary science, engineering, and animal and field husbandry. Each lecturer has his own lecture-room and office.

In the science subjects preparation-rooms are also provided.

The chemistry section consists of lecture-room, students' laboratory, and balance-room; research laboratories, ignition and balance rooms, storeroom, and offices.

Provision is also made in this block for a library and an agricultural museum.



Corner of the Chemical Laboratory.

The Residential Group.

This consists of the hostel and the dining-hall.

The Hostel, which contains 36 student rooms and 10 staff and visitors' rooms, is also a two-storied building in brick, with stone facings, and a tile roof. It possesses a veranda on the ground floor and a balcony on the top floor, of which good use is made by the students in the summer. The building is airy and conducive to health.

The new hostel to be built will form a wing of the present one, and will be approximately of the same size.

The Dining-room Building consists of a lofty dining-room, built to seat up to 100 persons, with kitchen, scullery, stores, and the matron's and cook's quarters attached.

Dining-Hall, Students' Hostel.

The Farm Buildings.

These are probably the finest in the country, and are built of dolorite quarried on the farm, and roofed with iron. The building for equines consists of stables and harness-rooms, with six stud-boxes.

Student's Bedroom.

The cattle buildings consist of two silos built into the feed and store and mixing rooms, from which emerge the cow-byre, bull-boxes, and calf-pens. The cow-byre is built to hold forty-two cows, and is fitted

1.—The Piggeries.
2.—Dutch Barn.
3.—Silos, with Cutter and Flow.

with stanchions, some in wood and some in iron frames. The feed-room is fitted with grinding-mills and chaff-cutters, etc., run from a general shaft by the portable engine, or run independently off a small petrol engine. Above the feed-rooms is the loft for grain and chaff, which is conveyed to the animals in iron nests. In addition there are the piggeries, with slaughter-house; workshops (carpenter's and blacksmith's); stores; implement sheds; outside calf-pens; sheep dip and cattle dip—all of stone; while the commodious sheep-shearing shed, fitted with machine shearers, and leading into drafting yards, is made of iron.

Students at Tennis.

The Sports Ground.

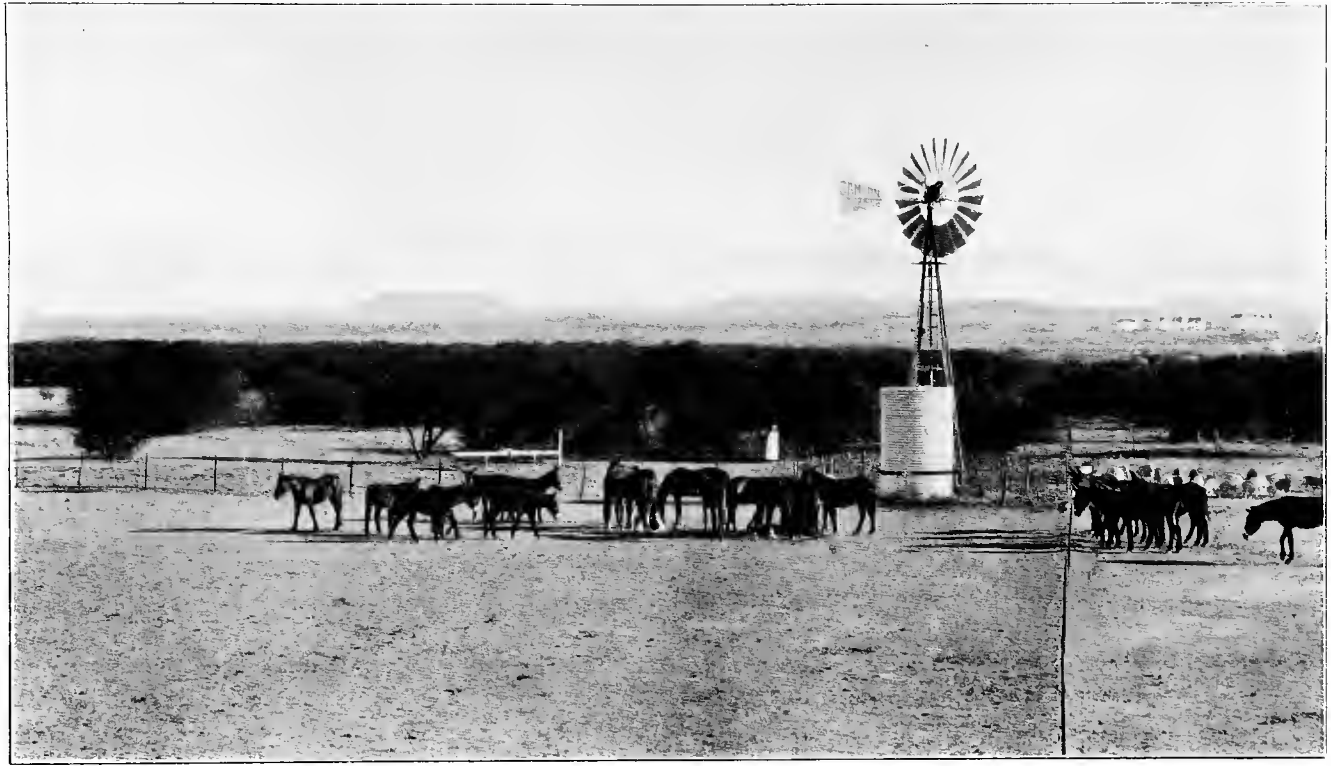
The sports ground lies to the north-west of the dining-room, and is used for football and cricket. Tennis courts are erected on the quadrangle between the dining-hall and the educational buildings.

Students at Cricket.

The Farm.

The area of the farm is just under 2000 morgen, extending to both banks of the river and both sides of the railway line. Fully half the area consists of mixed grass and bush veld. The bushes are mostly of the ganna type, and the grass, sweet grass. Steek grass appears on limited areas. As is generally the case with Modder River farms a large area is covered by mimosa and other thorn trees.

Excluding the cultivated lands, the farm is divided into fifteen camps. The boundary of that part of the farm on which the buildings are situated is enclosed with jackal-proof fencing. All camps are supplied with borehole water for stock.



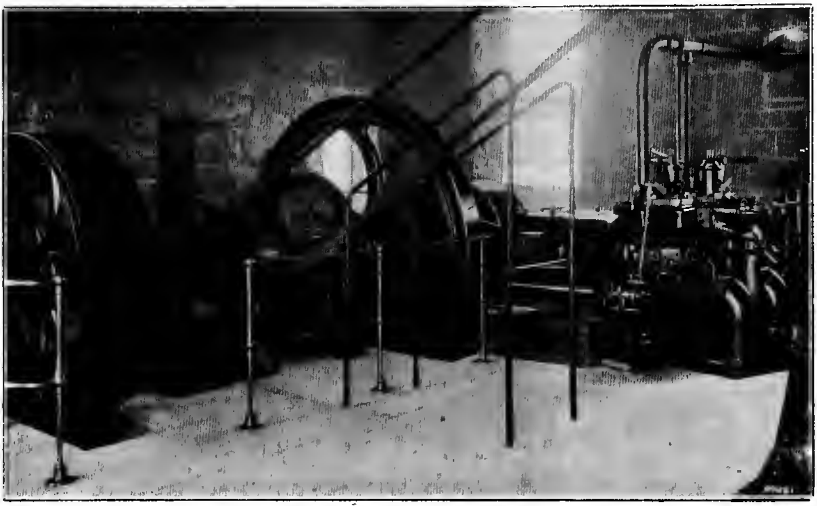
The Paddocks.

The present irrigated land borders on the north bank of the river, and is divided into fields varying from 10 to 33 acres. The soil varies from a sandy loam to a heavy clay. The present area under irrigation is 300 acres. It is intended to gradually increase this area to the full capacity of the irrigation plant. When the Upper Modder River Irrigation Scheme is completed an additional acreage will come under irrigation.

The crops grown under irrigation are lucerne, wheat, oats, barley, mangels, and permanent pastures, including Kikuyu grass.

The dry lands are situated on the north-eastern boundary. The soil is a sandy loam. The crops grown are maize, cowpeas, potatoes, and salt bush. The three first crops are grown in rotation.

Provision is also made on both the irrigated and dry lands for experimental plots, where manurial variety and other tests are conducted.



Engine Room, Irrigation Plant.

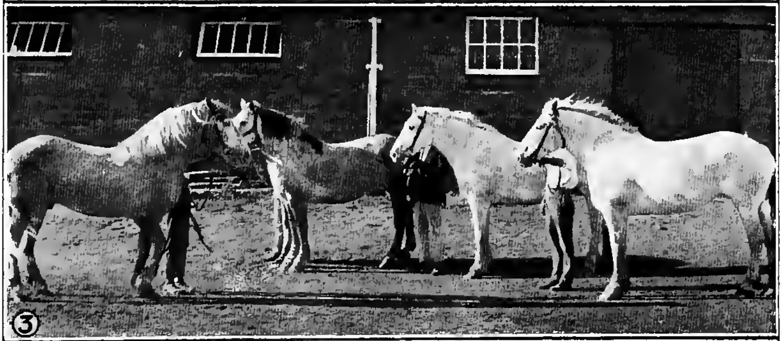
Machinery, Implements, etc.—A large variety of machinery and implements, including petrol, oil, steam, and gas engines, threshers, planters, ploughs, cultivators, etc., are kept for necessary farm operations and for instruction to students.

Live Stock.—The following pure-bred stock are maintained on the farm for educational and experimental purposes:—

Thoroughbred, Percheron, and Clydesdale horses.
Catalonian donkeys.
Fries, South Devon, and Lincoln Red cattle.
Large Black and Berkshire pigs.
Tasmanian and Wanganella Merino sheep.
About fourteen breeds of poultry.

In addition a number of horses, mules, and oxen are maintained for draught purposes.

Dairy Section.—A large, commodious, up-to-date dairy will be completed early in 1920, and it is intended to equip it in such a

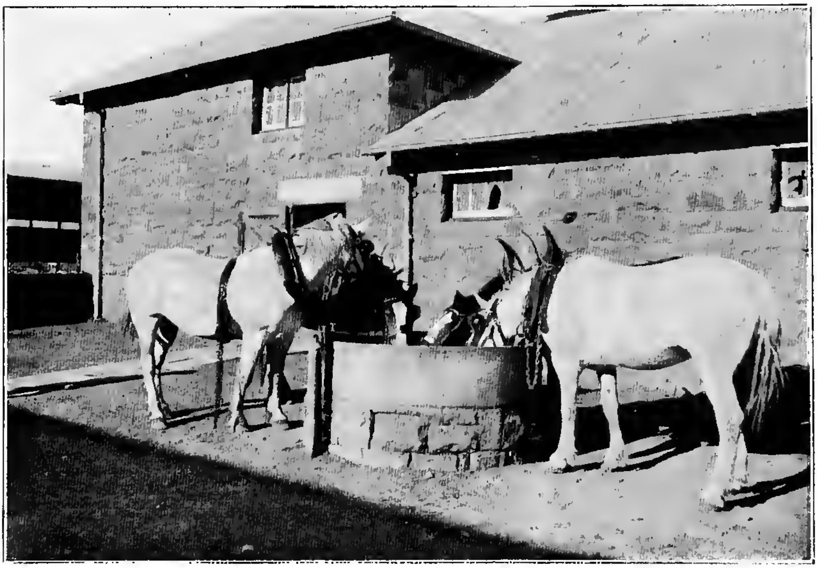


1.—South Devon Bull and Cows. 3.—Percherons.
2.—Friesland Cattle. 4.—Clydesdales and Percherons.

manner as to make this the dairy school of the Union. The school is situated in a good dairy area, and the creameries of the Orange Free State have already gained such fame as to merit special attention being given to dairying in this Province. A special one-year dairy course will be given.

The Horticultural Section.—A large orchard has been established and contains the following kinds of fruits: Apple, pear, plum, apricot, and peach. One-half the orchard is for experimental purposes and the other half is a commercial apple orchard.

The Engineering Section.—This comprises the blacksmith's, mechanic's, carpenter's, and saddler's workshops, where ordinary farm repairs are done and instruction is given to the students. The electric plant for generating electricity for lighting the hostel and other buildings, gas for supplying gas to the chemical laboratory, and an irrigation plant capable of irrigating 300-400 acres of land, all fall under this head.



Percheron and Clydesdale Mares.

The Poultry Section is fully equipped with pens for breeding, chicken rearing, individual pens for building up egg-laying strains and treating of breeding stock. An egg-laying competition for poultry-men in the school's area will be instituted in the near future.

SCHOOL AND FARM ACTIVITIES.

Extension Work.

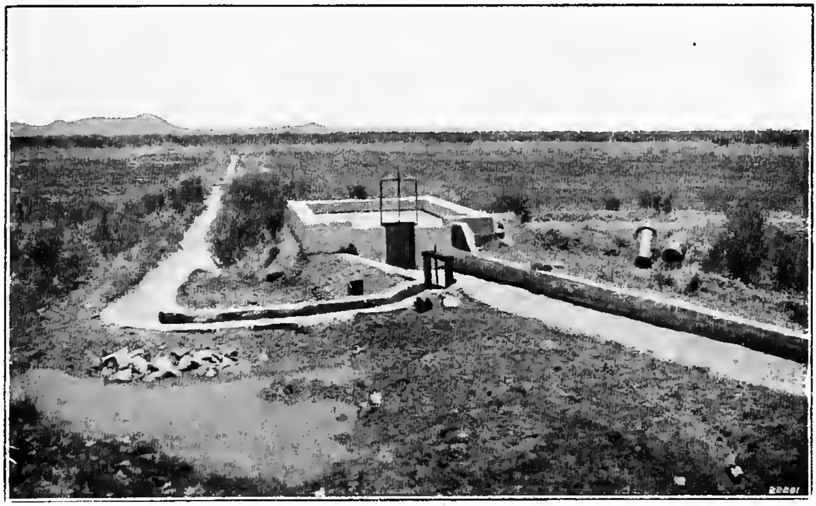
The Agriculture of the Area.—The principal classes of farming in this area are stock-raising and the production of crops. In the north-eastern and eastern districts of the Orange Free State the climate and soil are suitable for the best development of stock and crop-raising. The natural tendency at present is for these districts to develop on dairy lines. Dairy cattle and the growing of crops, principally maize and hay crops, therefore predominate, although sheep, horses, and beef cattle are also kept.

Proceeding west the rainfall decreases, and sheep farming predominates, although the climate is eminently suited for breeding light horses, mules, and donkeys. This area extends right into Griqualand West until arid conditions prevail in the Kalahari.

With an area varying so greatly it is only natural that a variety of problems have to be dealt with and considered during the course of the two-years' instruction.

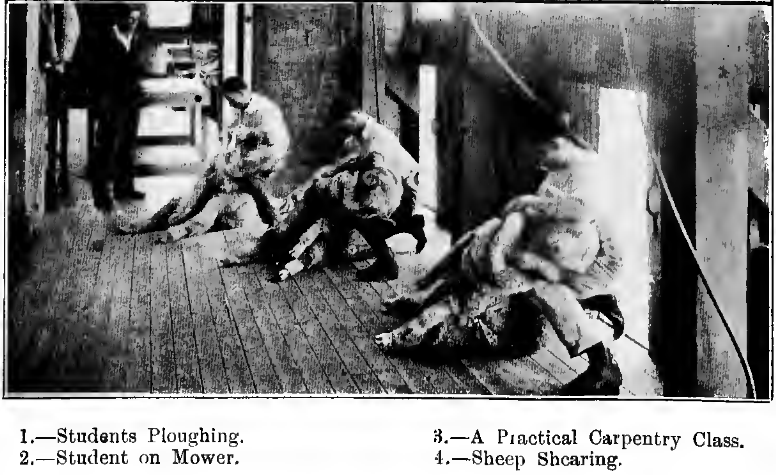
Instruction to Students.

The instruction given to students may be grouped under three heads: Lectures, Demonstrations, and Practical Work. These are interrelated, interdependent, but for purposes of instruction they are kept distinct. Approximately half of the student's instruction is given in the classrooms and laboratories, and the other halt is devoted to practical work in the fields, workshops, and the different farm sections. Thus the student has the best opportunity of relating in his own mind agricultural science and theory to agricultural practice. The student is not turned out an expert, but he is set on the road with a sound, well-balanced agricultural education in the making of a first-class farmer.



Irrigation.

Lectures are given in animal husbandry, field husbandry, sheep and wool, dairying, agricultural chemistry, agricultural botany and zoology, veterinary science, horticulture, poultry husbandry, farm economics, book-keeping, and agricultural legislation. Demonstrations are given periodically in the suitable subjects, and laboratory instruction is regular in the science subjects.



1.—Students Ploughing.
2.—Student on Mower.

3.—A Practical Carpentry Class.
4.—Sheep Shearing.

The practical work is divided into the following groups: Farm, stock, blacksmithy, carpentry, saddlery, engineering, poultry, dairying, and horticulture. Each student is on each branch of practical work one week at a time, and is then transferred to another branch so as to have an opportunity of doing all kinds of work during the year. An individual record is kept of each subject, as also the branch and kind of work performed, as well as the manner. At the end of the year the record of practical work of every student is registered.

Advantage is taken of the various shows occurring in the vicinity to enlarge the students' knowledge of the various breeds of stock, types of crops, and machinery. The students are taken to the Central Agricultural Society's Show in Bloemfontein, and there act as stewards in the various sections, by which means they pick up a good knowledge of preparation of stock for show, and judging. Students are also taken to abattoirs, bacon factories, creameries, and well-known farms in the vicinity where special breeds are kept.

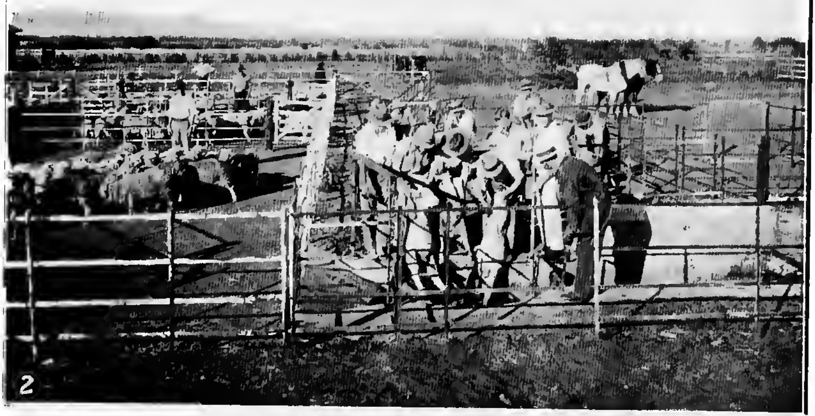
An inter-school stock judging competition, to be held each year at the show in Bloemfontein, has been initiated, and the best Glen students will have an opportunity of competing with those of other schools of agriculture.

Group of Catalonian Donkeys.

Much of the time of the lecturing staff is occupied in extension work; this consists of co-operative experiments, correspondence with inquiries direct, and supplying answers to queries in the agricultural Press, lectures at farmers' weeks, judging and lecturing at shows; analysis of soils, feeding-stuffs, and manures by the agricultural chemist at a fixed price. Visits are made to farms by the staff on request to give advice when circumstances permit.

Experimental and Investigational Work.

Variety, manurial, and crop rotation trials have now been commenced, and it is hoped in the near future to conduct experiments and research into the cost of production of farm crops under irrigation and dry lands, of milk, and of pigs for bacon; also various economic problems, such as cost of the various forms of farm labour, horse, ox, fuel power, and so forth. In the poultry division various experiments



1.—Cattle Dipping.
2.—Sheep Dipping.
3.—Tasmanian Sheep-Grading Pens.

on the best methods of storage of eggs have long been in progress; also chicken-rearing, cost of feeding, etc.

In the chemistry section special provision has been made for research work in soil fertility.

The botanical and entomological sections are also well equipped for purposes of research in their respective branches.

Farm Work.

The following is a routine of the general work on the farm during the course of a year:—

When the students arrive in January the ordinary farm work is in full swing, such as cultivation and irrigation. Haying has also commenced, and all the stock for the shows have been brought in.

Cultivation of land for permanent pastures and winter crops also receive attention. During the latter part of January and the whole of February planting of deciduous trees, etc., takes place.

The majority of winter crops for grazing during the winter is planted during March. April is usually a very busy month, and the following are some of the main operations on the farm: Hay-making, ensilage cutting, and lambing of ewes.

In May the stock for the annual sale in September is brought in, and ploughing of all cropping lands is commenced.

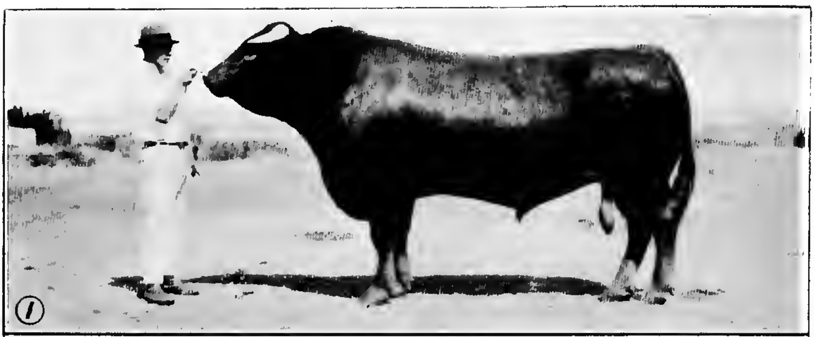
During the winter months the maize crop is harvested and threshed, all machinery is overhauled, pruning of the orchard is done, and general development is undertaken.

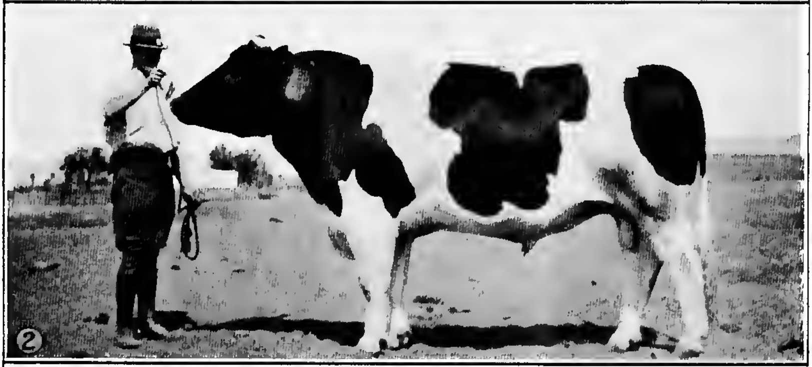
Incubation takes place during August and September. As soon as the spring rains commence all the land is reploughed and seeding and planting of summer crops commenced. During the spring and early summer shearing and mating of ewes take place.

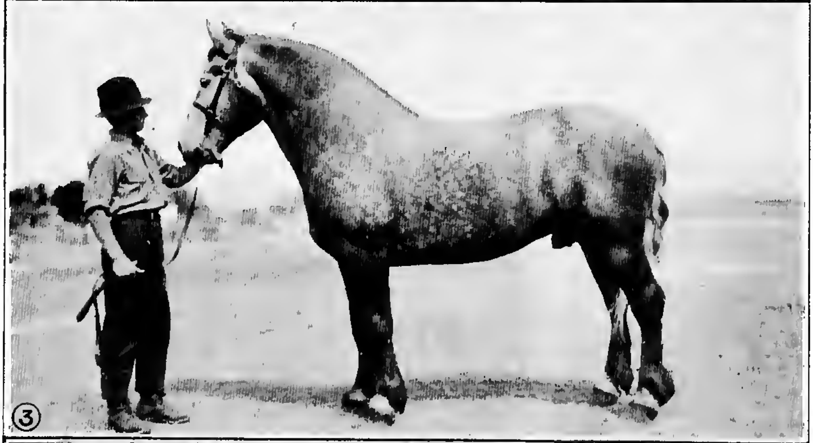
By the time the students leave for their Christmas holidays the bulk of the winter crops have been harvested. The student, therefore, has a good opportunity of taking a practical part in all the principal operations on the farm.

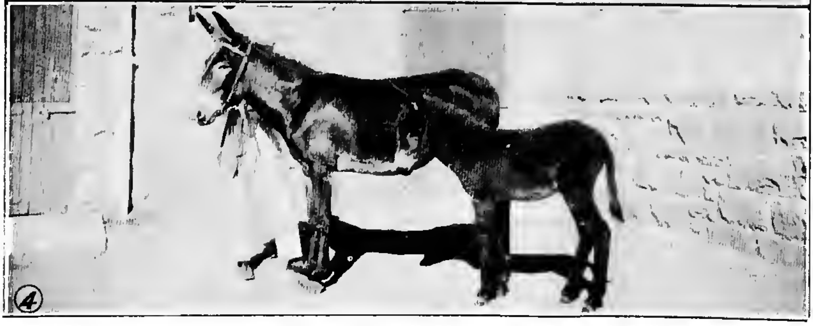
Annual Sale of Stock.

A sale by public auction of the progeny of pure-bred stock maintained on the farm is held each year.









1.—South Devon Bull.
2.—Stud Friesland Bull.
3.—Percheron Stallion.
4.—Donkey Mare and Foal.

COURSES OF INSTRUCTION.

The courses offered are as follows:—

I. Diploma Course.
II. Special Course in Dairying.
III. Short Winter Vacation Courses.

I.—THE DIPLOMA COURSE.

The course is of two years' duration, beginning in January of each year.

Admission of Students.

It is strongly recommended that those who have not had experience of farm life and work should acquire a practical knowledge of farming operations before entering upon the course.

Students will only be admitted at the commencement of each school year, i.e. in January. The minimum age of entry is 16 years. Candidates must furnish proof that they have passed at least the Junior Certificate examination or its equivalent, and produce satisfactory references as to character and evidence of good health. Preference will be given to men with a higher standard of education. Application should be made on the prescribed form (see Appendix). Applicants undertake thereby to remain at the school for the full period of two years, if accepted, and are liable for the full fees for this period, unless requested to leave owing to inability to profit by the instruction, sent away for misconduct, or allowed to withdraw before completion of the course for reasons approved by the Secretary for Agriculture.

Fees.

The fees are at present £50 per annum, payable quarterly in advance. These include tuition, board, laundry, and ordinary medical attendance at the institution. A sum of £2 must be deposited to cover breakages, damage to Government property, etc.; any balance is returned to the student on completing his course.

Scholarships and Bursaries.

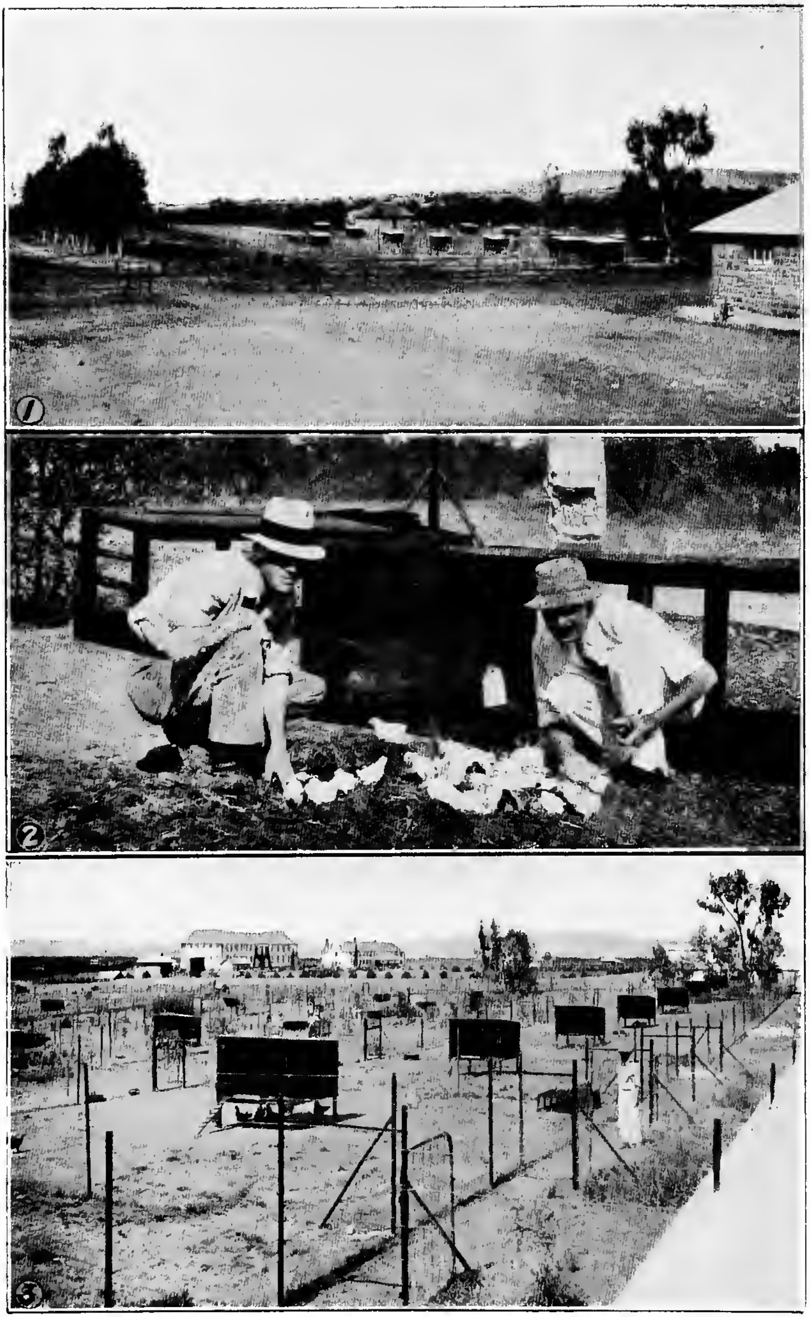
A few assistance bursaries (value £50 and £25 per annum) may be awarded each year to the sons of parents who are not in a position to pay the fees or are able to pay portion of the fees only.

Conditions and particulars of the award of these bursaries are generally published about October.

Scholarships for advanced study in agriculture and agricultural science are usually offered annually by the Department of Agriculture to matriculated and bilingual students, and the diploma of the school is regarded as a valuable qualification in determining the choice of successful candidates.

Sessions.

The school opens in January of each year and terminates in December. During the year the school is closed for vacation for about seven weeks in June and July, and about five weeks at Christmas, and residence during these periods is not allowed without special permission from the principal.



Poultry Division.

Hours of Work.

Lectures and practical work are arranged according to a time-table drawn up from time to time by the principal. The working hours of students are generally from 6 a.m. to 6 p.m. in the summer time, but during the winter season they are a little shorter.

The time-table provides for approximately half the time of the student being occupied on practical work, and the other half on lectures and demonstrations and laboratory work.

Students are also expected to spend their evenings profitably in study and reading.

Agricultural Faculties at Stellenbosch and Pretoria.

Matriculated students who are successful in gaining the diploma of the school will be given facilities at the Faculties of Agriculture at Stellenbosch and Pretoria to take up study for the degree of Bachelor of Science in Agriculture. Such students will be able to complete the degree course with three years' further study.

Railway Concession.

Concession certificates enabling railway tickets to be obtained at half fare are given to students travelling to and from the school where the distance exceeds fifty miles.

REGULATIONS.

The regulations to be observed by students will be found at the end of the Prospectus.

SUBJECTS FOR THE TWO-YEAR DIPLOMA COURSE.

Part I.

	Maximum Marks.
Animal Husbandry	100
Field Husbandry	100
Poultry-keeping	50
Farm Book-keeping	50
Chemistry and Geology	50
Botany	50
Agricultural Zoology	50
Agricultural Engineering...	50
Veterinary Science	50
Total	600

Part II.

	Maximum Marks.
Animal Husbandry	250
Field Husbandry	200
Agricultural Economics and Law	100
Dairying	100
Horticulture and Forestry	50
Veterinary Science	100
Agricultural Chemistry	100
Agricultural Botany	100
Agricultural Entomology	100
Agricultural Engineering	100
Total	1200

Examinations.—Periodical examinations will be held during the year, and the marks obtained will be considered in determining the pass marks for the year.

Pass Marks (Part I).—50 per cent. in animal husbandry, 50 per cent. in field husbandry, 40 per cent. in all other subjects.

Students who may fail to pass not more than two subjects will be re-examined. Students who fail in more than two subjects will be considered to have failed in the work of the year.

Pass Marks (Part II).—60 per cent. in animal husbandry, field husbandry, dairying; 40 per cent. in remainder and 50 per cent. in aggregate.

Practical Work Marks.—Of the total marks for each subject in which practical instruction is given, 25 per cent. will be allotted for such practical work.

Distinction with Diploma.—The diploma will include the award of distinction in each subject in which 80 per cent. of marks is obtained.

Certificates in Agriculture will be awarded to candidates who do not qualify for the diploma, but obtain marks as follows:—

60 per cent. in animal husbandry, field husbandry, and dairying.

30 per cent. in agricultural chemistry, agricultural botany, and agricultural entomology.

40 per cent. in all other subjects.

Textbooks and Notebooks.—Students will be required to obtain the necessary textbooks, which will be recommended by the principal or lecturers.

Each student is expected to provide himself with a suitable notebook for each subject.

SYLLABUS.

Animal Husbandry.

The course in animal husbandry is intended to give the students a general idea of the various breeds of farm live stock; particular attention is given to the judging, breeding, and management of the breeds most commonly met with in South Africa.

The student is also instructed in the laws governing the breeding of live stock, the uses and the value of feeds, particularly of South African-grown feeds; the preparation of stock for sale and show; the care and management of draught and light horses, dairy and beef cattle, sheep, and pigs.

Ample opportunity exists for the student to pay particular attention to the breeds of stock he is specially interested in.

Study of Breeds—

Origin, history, and description of the chief breeds of farm live stock.

Characteristics of different breeds and types.

Judging different breeds and types.

Suitability of the various breeds for different requirements and varying conditions in South Africa.

Principles of Breeding—

The mechanism and development. Heredity. Law of ancestral inheritance. Laws of Mendel as applied to animal breeding. Internal and external causes of variation. Prepotency. Principles involved in breed improvement by selection. Systems of breeding, grading, in-breeding, line-breeding, cross-breeding. Improvement of South African farm live stock.

A study of stud, herd, and flock books. Marking and recording pedigree stock. Organization, rules, and regulations of The South African Stud Book Association and Breed Societies.

Feeds and Feeding—

The functions of protein, carbohydrates, fat, etc., in the animal body. The composition, feeding value, and the uses of the following:—

- (*a*) Cereals and their by-products.
- (*b*) Oil-bearing and leguminous seeds and their by-products.
- (*c*) Leguminous plants for fodder purposes.
- (*d*) Silage.
- (*e*) Miscellaneous feeding stuffs, such as mangels, turnips, pumpkins, rape, salt bush, etc.

The preparation of feeds. Feeding standards. Valuation of feeds. Suitable rations for different classes of stock.

Cattle—

Breeding, feeding, and management of—

- (1) pure bred stock;
- (2) ordinary stock;

with special reference to—

- (3) beef cattle;
- (4) dairy cattle.

Production of beef and milk. Cost and disposal. Estimating live and dead weight. Feeding and management of draught oxen.

Horses, etc.—

Breeding, feeding, and management of horses, mules, and donkeys. Conditions necessary for success.

Pigs—

Breeding, feeding, and management, with special reference to—

(*a*) Breeding herd.
(*b*) Pigs for pork and bacon production.

Sheep and Wool—

Definitions and explanations of terms used.

Merino sheep—types, points, and judging; classing, breeding. feeding, and management.

"Mutton" breeds—types; fattening sheep.

Nature, use, and qualities of wool; sorting and scouring; shearing and preparation of wool; curing and marketing of skins.

Practical Work—

Students receive practical training in the care and feeding of farm live stock, in milking, shearing, etc.

Field Husbandry.

The object of the field husbandry course is to provide the student with the necessary knowledge, theoretical as well as practical, for the cultivation and treatment of the soil as well as the successful growing of crops. The chief crops discussed are those representative of this Province, together with some promising ones. Due emphasis is laid on the necessity of maintaining the fertility of the soil, by means of rotations, etc. The principles of dry-farming and irrigation practice are dealt with in full. The handling, harvesting, and marketing of field products, as well as methods of storing, form a necessary part to this course. Special attention is also given to economy in the use of labour and machinery in addition to the advantages and disadvantages of different systems of farming.

Soils—

Formation, properties, and classification. Soil fertility.

Soil Management—

Tillage principles and practice. Farm implements and their uses.

Irrigation and drainage. Amelioration of soils

Manures—

Kinds, value, and uses. Suitability for various crops and soils.

Crops—

Ordinary and special farm crops; adaptation to different soils and climatic conditions; varieties; preparation of land; cultivation; seeding; harvesting and marketing. Cost of production. Rotation of crops. Ensilage. Haymaking. Improvement of crops by selection. Judging of grain and other crops. Pastures—composition, uses, and improvement. Weeds and their eradication.

Practical Work—

Students are required to do practical work in ploughing, cultivation, sowing, harvesting, irrigation, stack-building, fencing, etc.

Agricultural Economics and Law.

The aim of this course is to train the student in the "business" of farming.

Elementary principles of rural economy.

Government; Parliament and its constitution; public finance.

Citizenship.

Agents of production; organization; marketing and prices.

Laws of supply and demand.

Land tenure.

Agricultural credit. Co-operation.

Selection and purchase of farms; capital required, returns, risks, etc.

South African economic problems.

Organization of the Union Department of Agriculture.

Agricultural legislation affecting land tenure and mortgage bonds, land settlement, fencing and dipping, masters and servants, animal diseases, seeds and fertilizers, etc.

Farm Book-keeping.

This course instructs the student on the principles of book-keeping, necessary for recording the financial transactions on the farm, from which reliable conclusions can be drawn. The cost of producing the various farm products is enlisting the attention of all practical farmers. For not only does it serve as a guide to a reasonable selling price, but it also shows which enterprises are remunerative and which should be abandoned. By a proper system of accounts and records the farming operations can be conducted on sound business principles, and losses due to unnecessary expenses avoided.

General principles of book-keeping.

Description and use of suitable books to be kept for farm accounts; profit and loss account; valuation and balance-sheet.

Commercial methods and correspondence.

General business terms.

Dairying.

This course aims at the proper care and handling of milk and cream on the farm, the manufacture of butter and cheese, the use of the by-products, and the rôle played by the various organisms important in milk and its manufactured products. The laws affecting the production and sale of milk and its products are included in this course.

In the first year the lectures and practical work deal with the testing of dairy products and butter-making by hand power.

In the second year of the course the student's time is taken up in the manufacture of the different varieties of cheese. Instruction is also given in the systems of mechanical refrigeration.

Milk and Cream—

The secretion of milk; conditions affecting secretion; variation in composition; milking, dairy utensils, and appliances; cooling and refrigeration; separation and ripening of cream; different systems of cream raising; utilization of skim milk; keeping of milk; importance of cleanliness; milk records and milk record societies; treatment of milk for sale; pasteurizing; milk testing.

Butter-making—

Churns and other butter-making appliances; churning, washing, and working of butter; circumstances affecting the flavour and keeping qualities; defects in butter.

Cheese and Cheese-making—

Principles of cheese making; making of different kinds of cheese; use of rennet and its substitutes; preparation of the milk; importance of acidity; tests for acidity in milk and curd; effects of temperature; salting, pressure, ripening, storing; defects of cheese.

Bacteria in the Dairy—

Functions, uses, control, etc.; propagation and use of cultures.

Dairy Legislation—

(*a*) Adulteration of dairy products.
(*b*) Use of preservatives.
(*c*) Municipal by-laws affecting production and sale of milk, etc.; buildings used for dairy purposes; health of dairy cows.
(*d*) Dairy Industry Act of 1918.

Horticulture.

This course deals with the propagation, laying out, cultivation, irrigation, pruning, marketing, etc., of commercial orchards.

In addition students receive lectures and practical instruction on the growing and management of a vegetable garden.

Propagation of Fruit Trees and Vines—

Seeds, layers, cuttings, budding, and grafting.

Soil and Situation of the Orchard—

Climatic influences, laying out of orchards and vineyards. Suitability of varieties, shelter belts.

Cultivation—

Irrigation, manures, cover crops.

Pruning—

Summer and winter pruning.

Spraying—

Treatment for fungous diseases and insect pests.

Handling of Fruit Crops—

Thinning the fruit; gathering, wrapping, and packing, storing and marketing; fruit drying and preserving.

Vegetable Gardening—
Situation, preparation of soil, manuring, selection of varieties, sowing, planting, rotations, diseases.

Forestry.

Need and value of afforested areas.
Trees suitable for different soils and climatic conditions.
Propagation of trees. Preparation of land and planting.
Uses and value of different varieties of trees.

Poultry Husbandry.

The course of lectures, demonstrations, and practical work in poultry-keeping is intended to give the student a sound knowledge of the principles in connection with all sections of poultry-keeping. It enables him later as he gathers experience to select, handle, and treat poultry correctly on the farm, or to launch out as a poultry farmer, the former being considered more important. Special stress is laid on the economical value of poultry on the general farm in converting many waste products or foods into a marketable commodity.

The symptoms, causes, and treatment for ordinary diseases which will and do make their appearance are explained.

The most modern methods of marketing all poultry products, eggs, table birds, feathers, etc., both for local and overseas markets, are practically demonstrated.

Business management, economy in outlay of capital, and working expenses are an important part of the course.

The advantages of disposal and purchasing of products and necessaries through co-operation is made clear.

Poultry, Ducks, Geese, and Turkeys—
Origin, types, and characteristics; value of different breeds, mating, selection of breeding stock, etc.

Housing and Management—
Different types of houses; intensive and range systems.

Incubation—
Types of incubators; care and management; care of "setting" hens; comparison between natural and artificial methods.

Artificial Brooders—
The use and construction of artificial brooders; comparison between natural and artificial methods.

Foods and Feeding—
With special reference to the feeding of South African produce.

Killing and Trussing—
Various methods of killing and trussing, packing, and marketing.

Marketing and Storing of Eggs—
Testing, grading, packing, and marketing of eggs; preserving eggs for home use.

Caponizing—
Practical instruction.

Appliances—

Instruction in the making of sundry poultry appliances.

Diseases—

Causes, prevention, and treatment.

Agricultural Engineering.

The object of the agricultural engineering course is to convey a combined theoretical and practical knowledge so as to keep abreast with modern requirements in connection with the design and construction of farm buildings, prime-movers, implements, machines, and general farm equipment. In fact this institution is well equipped so as to impress any interested and observant students.

The workshops are large, well equipped, and staffed by experienced mechanics, etc., so as to give the necessary tuition in the handling of all tools and general construction of farm work, also the handling, overhauling, and necessary repairs to steam, gas, oil, and petrol engines, windmills, pumps, threshers, harvesters, and other farm machines, along with tuition in general blacksmithy.

Part I.

Mensuration—

Common and essential rules for the measurement of land, water, and materials.

Applied Mechanics—

Principles of levers, pulleys, work, horsepower, etc.

Agricultural Implements and Machinery—

Principles of construction and action. Care, running, etc.

Building Construction—

Materials of construction. Defects in timber; preservation of wood underground; dry rot—its causes and prevention; prevention of dampness in walls. Bricklaying, masonry, and concrete work. Fences; principles of construction; different types; materials—uses and cost.

Pumps—

Principles of pumping. Reciprocating, centrifugal, and other types of pumps.

Prime-movers—

Water wheels and water turbines. Windmills.

Part II.

Prime-movers—

Steam boilers and engines. Gas, oil, and petrol engines.

Land Surveying—

Chain surveying and plotting. Determination of areas. Setting out land.

Levelling—

Theory and general principles. Plotting of sections. Laying out irrigation canals.

Irrigation and Drainage—

General principles. Design and construction of small irrigation works, including dams. Duty of water. Measurement of the flow of water in canals and streams. Systems and cost of drainage. Causes and prevention of sluiting.

Farm Buildings—

Design and construction of typical buildings. Arrangement of homestead. Preparation of drawings.

WORKSHOPS—PRACTICAL WORK.

Machinery, Implements, etc.—

The construction, adjustment, and uses of various agricultural implements.

The care, management, and running of engines, windmills, pumps, etc.

Carpentry—

Instruction in sharpening, handling, and setting of tools. Planing and sawing wood; making joints; general carpentry work on farm, such as repairing woodwork of carts, wagons, and farm implements; making, hanging, and repairing gates; practical instruction in erection of fencing; rope splicing; preparation of paint; painting new and old work; killing knots.

Building Construction—

Setting out foundations; making concrete; making of lime mortar; bricklaying in English bond.

Smithy—

Practical work, including attention to horses' feet, making shoes, welding of iron, tempering steel, making bolts, hooks, etc.; laying points on plough-shares, sharpening picks, tyring wheels, and repairing of farm implements.

Plumbing—

Cutting and screwing of pipes. Soldering.

Saddlery—

Thread-making and stitching; splicing parts of harness; choosing leather; cutting leather from hide for different parts of the harness; easing and fitting collars and saddles; general repairs to harness, etc.

Veterinary Science.

The object aimed at in this course of lectures and practical demonstrations is to impart a thorough practical knowledge of the causes, symptoms, courses, treatment, post-mortem appearances, and preventive measures of the common diseases affecting stock in South Africa. Special instruction is given with a view to fortify the young farmer against the ravages of South African diseases, both as regards prevention and the most rational methods to be adopted once the disease has made its appearance. The student is instructed practically in the methods of inoculation, veterinary first-aid and minor surgery.

PART I.

Anatomy—

Anatomy of the horse and principal points of difference in the ox, sheep, and pig.

Physiology—

Function of various anatomical structures in the body; digestion, absorption, nutrition, circulation, respiration, secretion, excretion, muscle, nervous system, reproduction, skin.

Examination of urine, bile, milk.

Materia Medica—

Forms in which medicines are used and methods of administration.

Therapeutic action and uses of medicines most commonly used in veterinary practice.

Toxicology—

Most common vegetables and mineral poisons.

Antidotes—

Chemical and physiological.

Pharmacy—

Dispensing of medicines.

PART II.

Medicine—

Classification of diseases.

Fevers: cause, symptoms, and treatment.

Specific diseases: causes, distribution, method of spread, incubation; symptoms, treatment, and post-mortem appearances. Reference is specially made to South African stock diseases.

Diseases of—

- Blood and circulatory organs.
- Digestive organs.
- Respiratory organs.
- Urinary organs.
- Generative organs.
- Skin.
- Cerebro-spinal system.

Instruction in meat inspection.

Surgery—

Handling and securing animals for operation.

Use of anaesthetics.

Pathological conditions: inflammation, suppuration, ulceration, gangrene.

Wounds.—Incised, punctured, lacerated, fistulous, poisoned.

Haemorrhage.

Injuries and diseases of bones, joints, bursae.

Injuries and diseases of other organs, with special reference to the foot, teeth, larynx, oesophagus, chest, eye, limbs, and genital organs.

Examination for soundness; most common surgical operations.

Obstetrics.

Chemistry and Geology.

The chemistry course in the first year lays stress on the particular substances, reactions, and topics leading to an intelligent knowledge of farm chemistry. It includes a practical knowledge of the physical properties of the different kinds of matter and the using of this knowledge in arranging the conditions of any chemical change. An aim is made to teach the student to do certain things intelligently rather than the mere remembrance of the bare results of chemical changes.

PART I.

Chemical and physical changes; constitution of matter.

Elements, compounds, and mixtures.

Special study of the atmosphere and water, the commoner elements, and their compounds of importance in agriculture.

Study of the more important organic compounds, chiefly in their relations as constituents of plants, animals, etc.

Chemical calculations.

Practical—

Exercises bearing on the lecture course with simple tests for the principal constituents of waters, soils, manures, foods, etc.

Geology—

The principal rock-forming minerals and their common properties. The chief kinds of rock, their formation, and decomposition. Brief outlines of the geology of South Africa.

PART II.

Agricultural Chemistry.

In the agricultural chemistry course the work includes the chemistry of soils and fertilizers and the laws governing their economic use, the chemistry of the plant and its food and growth, the chemistry of human foods and animal nutrition, the digestibility and value of foods, and laws for their economic use, with topics of an industrial nature related to the subject.

Soils—

Origin, formation, and classification.

Soil Physics.—Mechanical constitution and physical properties. Soil moisture and water requirements of crops.

Soil Fertility.—The chemistry of soils and of crops. Soil analysis.

Soil Biology.—Soil organisms in relation to fertility.

Manures and Fertilizers—

The chief natural and artificial manures in use; their origin and manufacture; chemical composition and their effect on the soil. Valuation of fertilizers. Adulteration. The Fertilizers Act of 1917.

Feeding Stuffs—

Composition of the animal body.

Constituents of foods and their functions in animal nutrition.

Composition and valuation of commoner types of feeding stuffs; food units; nutritive or albuminoid ratio. Residual manurial values of feeding stuffs.

Milk and Dairy Products—

Chemical composition and properties of milk and its products. Preservatives.

Fungicides and Insecticides—

Chemical composition and properties of the chief fungicides and insecticides employed on the farm and orchard. Cattle and sheep dips.

Practical—

Simple work on the qualitative and quantitative examination of soils, manures, feeding stuffs, milk and milk products. etc.

Botany.

The first year's course brings the student into touch with the structure, growth, and functions of flowering plants, while the natural orders studied are those which bear directly on agriculture and horticulture.

In the second year the recognition of and the characteristics of members of these orders, together with additional orders, are dealt with more fully.

Field excursions and the collection of plant specimens with their seeds play an important part in this course, special attention being paid to the plants of economic importance.

The recognition and control of plant diseases include both field and laboratory practice.

PART I.

The elementary morphology and anatomy of flowering plants as exemplified by *Helianthus*, *Quercus*, and *Zea*.

Simple experiments relating to the physiology of plants, and including elements of nutrition, photosynthesis, respiration, transpiration, and growth.

Characteristics of some of the more important natural orders—*Compositae*, *Cruciferae*, *Solanaceae*, *Leguminosae*, *Rosaceae*, *Malvaceae*, *Cucurbitaceae*, *Umbelliferae*, *Gramineae*, *Liliaceae*.

PART II.

Agricultural Botany.

The more important weeds as exemplified by species of *Alternanthera*, *Centaurea*, *Cnicus*, *Convolvulus*, *Cuscuta*, *Cyperus*, *Datura*, *Emex*, *Opuntia*, *Polygonum*, *Rumex*, *Striga*, *Tagetes*, *Xanthium*.

Common poisonous plants, including species of *Crotalaria*, *Datura*, *Dichapetalum*, *Geigeria*, *Homeria*, *Indigofera*, *Lolium*, *Ornithogalum*, *Ornithoglossum*, *Solanum*, *Urginea*.

Grasses and other fodder plants. their general suitability for different localities. Recognition of the following species:—*Andropogon* (sorghum), *Anthistiria*, *Aristida*, *Avena*, *Bromus*, *Chloris* *Cynodon*, *Dactylis*, *Digitaria*, *Eragrostis*, *Festuca*, *Lolium*, *Panicum*, *Paspalum*, *Pennisetum*, *Phalaris*, *Setaria*, *Tricholaena*.

Atriplex, *Medicago*, *Onobrychis*, *Opuntia*, *Polygonum*, *Sanguisorba*, *Trifolium*, *Vicia*.

Agricultural seeds:—

(*a*) Recognition of the more common agricultural and weed seeds: Wheat, barley, oats, rye, maize, millets (including broomcorns), rape, beans, beets, mangels, buckwheat, brome, burnet, chicory, clovers, cocksfoot, fescues, oat grass, *Paspalum, Phalaris*, sheep's parsley, Rhodes' grass, rye grasses, sainfoin, teff, vetches, lucerne, sunflower, linseed, with their impurities, including: Pigweed or misbredie (*Amarantus*), dodder (*Cuscuta*), drabok (*Lolium*), stinkblaar (*Datura*), rib-grass (*Plantago*), knotweed (*Polygonum*), catch-fly (*Silene*).

(*b*) Seed testing. Determination of true value of farm seeds.

Plant breeding. Simple methods of plant breeding for the general improvement of farm crops.

Structure and life-history of the following types:—*Bacillus subtilis, Spirogyra, Mucor, Saccharomyces, Agaricus, Oidium.*

Recognition of the macroscopic characters of the more important diseases of cereal and root crops, fruit and garden crops, caused by species of *Puccinia, Ustilago, Oidium, Macrosporium, Phytophthora, Entomosporium, Fusicladium, Calviceps, Plasmodiophora, Oospora, Exoascus*, and *Bacterium campestre*, with simple methods of control.

Elementary bacteriology.

Action and preparation of the more common fungicides.

Agricultural Zoology.

This course aims to give the student a fundamental knowledge of typical representatives of the main groups of the animal kingdom with reference to their habits, structure, and adaptations, in order that he may be in a position to study intelligently the control of those affecting agriculture.

General Survey of the Animal Kingdom.

(*a*) Vertebrates: Mammals, birds, reptiles, amphibians, fishes, and primitive vertebrates.

(*b*) Invertebrates: Molluscs, arthropods, echinoderms, segmented and unsegmented worms, coelenterates, porifera, and protozoa.

(*c*) Animals *versus* plants.

(*d*) The elements of structure: organs, tissues, cells, protoplasm.

(*e*) Chief functions of the animal body.

Habits and Adaptations of Animals.

The habits and special adaptations to their environment and mode of life of the cow, sheep, dog, pigeon, ostrich, lizard, frog, snail, millipede, spider, tick, butterfly, locust, bee, aphis, earthworm, liver-fluke, and amoeba.

Life-Histories.

The detailed study of the life-history of a frog, a fowl-tick (*Argas persicus*), a cattle-tick (*Boophilus decoloratus*), a dog-tick (*Haemaphysalis leachi*), a butterfly (*Papilio demoleus*), a locust, a tape-worm, a liver-fluke, a roundworm, and a malarial parasite.

The Organization of Animals.

The chief systems of the frog treated in an elementary manner, to be illustrated by dissections and drawings by the student.

A carefully kept notebook, containing notes on lectures and records of observations, is to be made by each student and presented at the examination on the year's work.

Agricultural Entomology.

This course acquaints the student sufficiently with the structure, development, and habits of insects to enable him to combat effectively the most important insect pests. Considerable attention is given to insecticides, spray machinery, and their manipulation in the orchard and field. Special attention is given to the most important pests of the Province and their control.

Organization and Classification of Insects.

The external character of the following types:—

Butterfly or moth; cricket or locust; beetles; plant-bug; fly; bee or wasp; and flea.

The chief systems of a locust or cockroach treated in an elementary manner. This to be illustrated by dissections and drawings by the student.

The mouth-parts of the type chosen for dissection to be contrasted in detail with those of a *Cicada* or plant-bug.

The classification of the insects mentioned above as illustrating the general principles involved.

The General Principles of Insecticides.

The requirements of an insecticide as determined by the organization of the insect pest.

The composition, method of preparation, and method of application of insecticides, such as arsenate of lead, lime sulphur, resin wash, poison bait for cutworms and for fruit fly, paraffin emulsion and tobacco extract, etc. The methods and dangers of the use of hydrocyanic acid gas and carbon bisulphide. The appliances used for spraying, dipping, and fumigation.

Life-Histories and Control Measures.

A careful study of the life-history of each of the following insects or types:—Codling-moth, cutworm, brown locust (*L. pardalina* W.), coccinellid beetle, plant-bug, coccid, housefly, mosquito, and dog flea. The life-history of one of the above to be observed from egg to adult by all students, and careful records made of observation. These records should be in the student's notebook, which will be required for examination.

The study of the life-histories and control of insects of local economic importance as time permits.

Notebook and Observations.

The student's notebook is to be presented for examination. This must record notes of lectures and observations by the student; records of the type, life-history studied, and personal observations made throughout the year with a view to answering the following questions:—

(*a*) Why are insects so successful as a class ?
(*b*) What natural agencies tend to hold them in check?
(*c*) Why is it sometimes advisable not to apply insecticides?

Apiculture.

Hives and fittings. Management of bees. Queen raising. Extraction of honey. Diseases and enemies of bees.

II.—SPECIAL COURSE IN THE SCIENCE AND PRACTICE OF DAIRYING.

The advance of the dairy industry has created a demand for skilled employees which is not at present met by a supply of men trained in South Africa.

In this Special Course in the Science and Practice of Dairying a suitable training is offered especially to those desirous of qualifying for positions of responsibility in factory dairies.

The course up to the factory stage is thorough and complete, and the school has the co-operation of the South African Creameries Association in making the necessary arrangements on suitable terms for students to complete the course at an approved factory dairy.

The course will extend over a period of twelve months, from January to December.

Conditions governing admission:—

(1) Candidates must be over eighteen years of age at time of entrance.

(2) Candidates must have—

(*a*) satisfactorily completed the diploma course at an agricultural school;

(*b*) or furnish evidence of having had considerable experience in practical dairying, supported by a satisfactory testimonial covering work performed.

(*c*) In the case of (*b*), candidates must have satisfactorily completed at least the course of instruction at a primary school or its equivalent.

(3) Candidates must furnish satisfactory evidence of good character and sound health.

(4) Candidates must be prepared to abide by the rules and regulations governing the conduct and the work of all students attending the institution.

Fees.—Students will be required to reside at the school, and the fees for the full course of twelve months will be £50, payable quarterly in advance. These include tuition, board, laundry, and ordinary medical attendance at the institution. A sum of £1 must be deposited to cover breakages, damage to Government property, etc.; any balance will be refunded on completion of the course.

Subjects.—The subjects and the maximum marks are as follows:

(1) Dairying	300
(2) Dairy Chemistry	150
(3) Dairy Bacteriology	150
(4) Dairy Engineering	150
(5) Book-keeping	150
(6) Animal Husbandry	100
(7) Factory Dairying and Management	300

Pass marks: 60 per cent. in Dairying and Factory Dairying and Management, and 40 per cent. in all other subjects, with 50 per cent. in the aggregate of 1 to 6 (inclusive).

After passing an examination in subjects 1 to 6 (inclusive) at Glen, students will be required to perform at least six months' work in factory dairying and management at an approved butter or cheese factory, and to undergo an examination therein.

Upon satisfactorily completing the course at Glen and at the factory dairy, and passing the examinations, students will be awarded a "Certificate in Dairying."

SYLLABUS.

1. Dairying.

Milk: Its nature and composition. Variations from the normal and their causes. Colostrum, composition of, dangers arising from its use in the manufacture of butter and cheese. Constituents of milk, their nature and average composition, their relative economic value. Relation of fat to casein content of milk. Structure of udder, and milk secretion. Influences affecting secretion. Hand and machine milking, effects of indifferent milking. Normal fermentation of milk. Relation of cleanliness to all dairy operations and general rules to be observed. Preserving of milk, physical, mechanical, and chemical methods. Milk records and recording societies, value of fat tests in connection therewith. Principles of milk grading under cheese factory and creamery conditions. Principles and practice of the different methods of cream separation. Utilization of skim milk. Pasteurizing and cooling temperatures for "market milk" under South African conditions.

Cream: Composition of; circumstances affecting its relative composition. Cream ratio. Butter ratio. Management and ripening of cream, explaining different systems in vogue for dealing with cream supplies prior to butter-making and their respective advantages. Propagation and use of pure cultures, with particular reference to the causes operating against their general adaptation in the creameries of South Africa.

Preserving of cream. Testing of all dairy supplies for butter-fat. Advantages and disadvantages of cream scale over pipette in cream testing under creamery conditions. Care of cream from time of production to delivery at creamery. Evils arising from the use of insanitary or rusty cans; their causes and prevention.

Butter: Principles of churning. Churning whole-milk, sweet and ripened cream. Churning and wash-water temperatures under differing circumstances. Washing, salting, working, packing, and storing of butter. Use of preservatives in butter. Circumstances affecting colour, flavour, and keeping qualities of butter. Renovating indifferent butter. Factors influencing percentage of water, salt, and curdy matter in butter. Calculation of over-run in the creamery, circumstances affecting same. Defects in butter and their causes. Judging and grading of butter.

Cheese and Cheese-making.—Milk for cheese-making. Essential points to be observed in its production. Principles and practice of cheese-making. Manufacture of various varieties of cheese. Effects of acidity, temperatures, pressure, salt, ripening, etc., in final cheese. Defects in cheese and their causes. Composite sampling of milk adapted to cheese factory conditions. Ratio of fat to casein and its practical bearing when purchasing milk on butter-fat basis. Rennet. Alkali and hot iron tests for acidity at various stages in cheese-making.

Theory and practice of refrigeration.

By-products of the dairy, their utilization and economic value.

Cream separating depots.

Dairy legislation:—

(*a*) Standards of purity demanded in dairy products.
(*b*) Municipal by-laws affecting the dairy industry.
(*c*) The Dairy Industry Act of 1918.

Determination of total solids, and solids not fat, in milk, estimation of percentage added water or fat extracted in adulterated milk.

Prices ruling in the South African and overseas market. General survey of these markets.

Organization and co-operation in the dairy industry.

Practical Work.—In their practical work students will have the receiving, handling, grading, and testing of milk, cream, and butter, the manufacture of butter by hand and power appliances, making of different varieties of cheese, pasteurizing, refrigerating, and separating of milk, testing and grading of dairy products, judging dairy produce, the running and management of dairy machinery, including refrigerating and cold storage equipment.

2. Dairy Chemistry.

General.—The constitution of matter. Forms of matter

Specific gravity, elements, atoms, molecules, compounds, mixtures. Temperature and the thermometer. The barometer and pressure. The atmosphere. Water; constituents and impurities, importance of water supply in dairying; solution, precipitation, filtration, distillation. Emulsions. The centrifuge as a means of separating precipitates or suspensions in liquids. The chemical elements and compounds of importance in dairying, including carbon compounds.

Acids, bases, salts, fats, saponification of fats.

Milk and its Products.—The nature, composition, and properties of milk. Factors which influence the quality and quantity of the milk of the cow. The chemistry of feeding. Changes produced on keeping milk—natural souring and artificial souring. Rennet and enzymes. Chemical and physical changes occurring in the making and storage of butter and of cheese.

Condensed milk, fermented milk.

Preservatives and their use, legal or otherwise.

The analysis of milk and cream by chemical and mechanical methods. The analysis of butter. The adulteration of dairy products. Methods employed for the detection of adulteration.

3. Dairy Bacteriology.

Microscopical study of milk, moulds, yeasts, bacteria. The principal kinds of bacteria met with in dairying—their forms, methods of reproduction, and conditions of life.

The influence of physical agencies on bacterial life. Bacterial examination of air, water, and dust. Changes produced in milk and its products by bacteria. Useful and injurious bacteria in the dairy.

Fermentation, putrefaction, coagulation, discoloration, taints, etc., caused by bacteria. Comparison of bacterial contents of good and bad keeping butters. Faults in cheese due to bacterial agency. Isolation of bacteria. Cream ripening—use of "pure cultures." Pasteurization, sterilization, refrigeration—their effect on bacterial life.

Disinfectants and preservatives. Objection to use of chemical preservatives. . The part played by bacteria and moulds in cheese ripening. Bacterial treatment of creamery sewage. Pathogenic organisms. Importance of cleanliness in the dairy. Bacteriological apparatus suitable for creameries.

4. Dairy Engineering.

General.—Work and power ; centrifugal force; fluid pressure; pumps, siphons, wells; effects of heat on the properties of matter; principles of refrigeration; compression; evaporation; condensation.

Transfer of heat; conduction; convection; radiation; units of heat; specific heat; latent heat; relation between pressure and boiling point; heat and work.

Buildings.—Types; planning; construction of creameries; cowsheds; piggeries; silos; drainage; lighting; ventilation, etc.

Water Supply.—Selection of site for well; sinking of wells; artesian wells; storage of water.

Sewage.—Methods of disposal of creamery sewage; septic tanks.

Boilers.—Types of boilers; evaporative power of boilers needed in creameries; insulation of boilers and steam-pipes; boiler fittings (their use and care); firing and care of boilers; cleaning of boilers; various methods of economizing steam; feed-water heaters; water purifiers.

Coal.—How to judge coal; economical stoking.

Steam-engine.—Construction and management of ordinary non-condensing steam-engine; setting of slide valves; power required; steam consumption.

Oil and Gas Engines.—Principles of the working of oil and gas engines; suction gas plants.

Machines and Machinery.—Various types of weighing machines, heaters, coolers, separators, tanks, vats, churns, pumps, butter-workers, cheese-presses, curd mills, refrigerating plants; elementary fitting; packing of glands; adjustment of bearings; shafting and brackets; lining up of machines; transmission of power; belting and belt fasteners; pulleys and gearing; speeds of various machines and description of methods of increasing and reducing speed of machines; tools required in creamery.

5. Book-keeping.

Principles. Commercial methods and business terms. Keeping of accounts, with special regard to the requirements of factory dairies.

6. Animal Husbandry.

Dairy breeds, origin, history, characteristics.
The principles of breeding dairy animals.
Management of dairy animals.
Foods and feeding of dairy animals.
Scoring and judging of dairy animals.
Pig breeding and management. Bacon and ham curing.
Milking.

7. Factory Dairying and Management.

General management of a South African butter and cheese factory, including machinery and refrigerating plants.

Grading and testing of cream for commercial purposes.

Proper methods of churning cream and working butter by power machinery.

Storage of butter and control of cold stores.

Grades and grading of butter.

Correct methods of packing butter for (*a*) South African markets; (*b*) export trade.

Note.—In the case of a cheese factory, the training would similarly cover cheese-making instead of butter-making.

REFERENCE AND TEXT BOOKS.

Dairying.

1. Milk and its Products, by Wing.
2. Principles and Practice of Butter-making, by McKay & Larsen.
3. Dairying in Australasia, by N. A. O'Callaghan.
4. Science and Practice of Cheese-making, by Van Slyke & Publow.
5. Milk, Cream, and Butter Testing Simplified, by C. W. Walker Tisdale.
6. Testing Milk and its Products, by Farrington & Woll.
7. Leerboek der Zuivelbereiding, by H. B. Hylkema (R. van der Velde, Leeuwarden).
8. Melk en Melkprodukten, by A. A. ter Haar (P. Noordhoff, Groningen).

Chemistry.

1. Chemistry, Inorganic, by A. F. Holleman.
2. Chemistry, Organic, by A. F. Holleman.
3. Feeding of Crops and Stock, by A. D. Hall.
4. Feeds and Feeding, by Henry.
5. Dairy Analysis (Laboratory Work), by H. Droop Richmond.

Dairy Bacteriology.

1. Bacteria in Milk and its Products, by Conn.
2. Outlines of Dairy Bacteriology, by Russell.

Animal Husbandry.

1. Pigs: "Swine in America," by Coburn.
2. Breeding of Farm Animals, by Marshall.

Engineering.

1. Instruction for Traction and Stationary Engineers, by Wm. Boss, U.S.A.
2. Wood's Thermodynamics, by John Wiley & Sons, U.S.A.

Book-keeping.

1. Farm and Estate Book-keeping, by Taylor & Piet.

Application for admission should be addressed to the Principal, School of Agriculture, Glen, Orange Free State, from whom any further particulars may be obtained.

III.—SHORT WINTER VACATION COURSES.

The vacation courses, which are held from June to August, are designed to meet the needs in particular of farmers, their wives, sons, and daughters, who are unable to devote more than a few weeks to acquiring some knowledge of the subject taught.

The lectures and demonstrations are specially prepared so that those attending them may secure the greatest benefit in the short time at their disposal.

Special leaflets are issued yearly dealing with these courses, and the particulars are advertised widely in the daily and agricultural papers.

Students for these courses are not required to submit evidence of educational qualifications.

The courses provided are:—

1. (*a*) Sheep and Wool Course.
   (*b*) Poultry-keeping, Horticulture, Dairying.

   These courses last nine days and run concurrently.

2. Three weeks' general course in Animal and Field Husbandry, Veterinary Science, Agricultural Engineering, Agricultural Legislation, and Agricultural Science.

REGULATIONS.

The general regulations to be observed by students are as follows:—

1. Students are not permitted to have in their possession spirituous liquors or fire-arms, except the service rifle.

2. Students are strictly forbidden to enter the bar or bars of any hotel in the town or towns near the school.

3. Students are required to attend divine service regularly, unless exemption under proper authority has previously been obtained.

4. Smoking is forbidden in the lecture-rooms, dining-room, dairy, stables, and fodder sheds.

5. Students are not allowed to keep motor cars.

6. Students must attend all lectures, practical and "duty" work regularly and punctually, and take all examinations set. Leave of absence from any of these duties will only be granted under exceptional circumstances, and permission must previously be obtained from the officer or officers in charge.

7. Students must remain within the precincts of the institution, except at certain prescribed times when leave will be granted.

These rules and regulations may be amended or added to at any time, and others may be enforced.

All students are expected to be provided with suitable clothing for farm work.

APPLICATION FORM.

To the Principal,
School of Agriculture,
Glen, Orange Free State.

I hereby apply for admission to the School of Agriculture.

.................................., as a student for the*..................

....

course commencing.............. ....192......

I agree to take the course in full, reckoned from that date, and to abide by the rules and regulations of the institution.

(Name)..

1. Date of birth...
2. Place of birth..
3. Schools attended and standard of education attained

....

....

4. Name and address of any one in the Union to whom reference can be made..

....

Signature...

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* Here state which course.

Certificate of Parent or Guardian.

I, parent/guardian of the above-named.............................., do certify that his present application for the............................... year course is made with my knowledge and consent; also that I do † ....wish him to attend Divine Service on Sundays. I further guarantee that he will remain at the school and complete the course applied for, and I will be responsible for the fees for that period, except when, for due cause, approved by the Secretary for Agriculture, the said student...................................may be unable to complete the course.

Name...
(Parent or Guardian.)

Occupation of parent...

Address...

Date..

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† Those having conscientious scruples fill in "not."

Certificate of Conduct.

(To be filled in by a Clergyman, Magistrate, or Justice of the Peace.)

I, the undersigned, who have known.....................................

for the last...................years, do hereby certify that he is of good moral conduct.

Signed.......................................

Qualification.................................

Certificate of Health.

(To be filled in by a duly qualified Medical Practitioner.)

I certify that I have examined..

and find him to be in a sound state of health, free from any defect or disease likely to prevent him successfully undertaking a course of training at a school of agriculture.

Signed...

Date...............................

N.B.—Evidence of "age" and "standard of education" must accompany this form.